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54 **FIRE DETECTION DEVICES INORPORATING A CORRECTION SENSOR**

57 The invention concerns a fire detection device (1) that includes a fire sensor that measures a primary physical quantity and generates a measurement signal, this measurement signal being influenced by a secondary physical quantity different from the primary one, the device incorporating in addition a correction sensor (4) to measure the secondary physical quantity and generate a correction signal.
Under this invention, the fire and correction sensors are linked to a microprocessor (2) which has stored in memory a curve representing the normal value i0 of the measurement signal as a function of the value of the correction signal in the absence of fire, and which is programmed to calculate i0 as a function of the correction signal and to determine the existence of a fire when the measurement signal does not fall within a defined range of values around i0.

[DIAGRAM]

IMPROVEMENTS TO FIRE DETECTION DEVICES

This invention relates to fire detection devices, and more specifically to such devices incorporating a fire sensor to measure one primary physical quantity, a variation in which is indicative of the existence of a fire in the vicinity of the detection device, this fire sensor generating an analog electrical signal, referred to as the measurement signal, having a value representing this primary physical quantity, this measurement signal being influenced by at least one secondary physical quantity different from the primary physical quantity, the device including in addition at least one correction sensor to measure said secondary physical quantity and generate an analog electrical signal, referred to as the correction signal, having a value representing the secondary physical quantity, with a view to correcting the influence of this secondary physical quantity on the measurement signal.

In previous techniques, the use of a correction sensor measuring the secondary physical quantity directly was known for the correction of the influence of ambient temperature on the gain of a fire sensor amplifier.

The correction sensor employed for this was a thermistor which was associated with the above-mentioned amplifier, the characteristics of this thermistor being chosen in such a way as to compensate as far as possible for variations in the amplifier gain with temperature.

However, this approach only allowed an approximate correction, inasmuch as it was impossible to match the thermistor characteristics precisely to the amplifier characteristics.

Furthermore, in order to compensate for the influence of interfering physical quantities other than temperature, it

was known, for example, to include in the detection device a second fire sensor subjected to the secondary physical quantity, but not to the conditions of a possible fire, in such a way as to determine the influence of the secondary physical quantity alone on the measurement signal. However, this approach was costly, as it meant having two fire sensors.

This invention aims specifically at remedying the above-mentioned disadvantages.

To this end, under this invention, a fire detection device of the type in question is principally characterized by the fact that the fire and correction sensors are linked to the same programmable central unit, so as to transmit to it the measurement and correction signals respectively, the central unit having stored in memory a correspondence table giving a so-called normal i0 value of the measurement signal as a function of the correction signal in the absence of fire, and the microprocessor being programmed:

- to determine the normal value i0 of the measurement signal as a function of the correction signal, based on a correspondence table
- and to determine the existence of a fire when the measurement signal lies outside the range $i0 - \Delta 1$ and $i0 + \Delta 2$, where $\Delta 1$ and $\Delta 2$ are pre-defined values.

In the preferred methods of implementation of this invention, one and/or the other of the following provisions may be employed:

- the secondary physical quantity is the ambient temperature;
- the fire sensor is an ionization detector, and the secondary quantity is the ambient humidity;
- the fire sensor is an ionization detector, and the secondary physical quantity is the ambient pressure;
- the measurement signal is influenced by several secondary physical quantities, the device including

several correction sensors, each linked to the central unit in order to each transmit to it a correction signal having a value representing one of the secondary physical quantities, the correspondence table stored in the central unit's memory giving a normal value i0 of the measurement signal as a function of the correction signal values, and the central unit being programmed to determine the normal value of the measurement signal as a function of the values of the correction signals based on said correspondence table.

Other characteristics and advantages of the invention will become apparent during the course of the detailed description below of one of the forms of implementation, given by way of a non-restrictive example, with reference to the attached drawings.

In these drawings:

- figure 1 is a diagrammatic view of an alarm system including a fire detection device as per this invention, and

- figure 2 shows an example of the curve of the normal value of the measurement signal generated by the fire sensor as a function of the correction signal generated by the correction sensor of the device in figure 1.

As shown in figure 1, the fire detector (1) as per this invention includes a programmable central unit consisting of a microprocessor (2) that includes at least 2 analog inputs (2a, 2b).

The first analog input (2a) is linked to a fire sensor (3) that measures a primary physical quantity, variations in which make it possible to detect the existence of a fire in the vicinity of the fire sensor. This fire sensor may be, for example, an ionization smoke detector, or possibly an optical smoke detector, or some other type.

The fire sensor sends to the microprocessor's first analog input (2a) an analog electrical signal i having a value (for example, current or

voltage) representing the primary physical quantity.

This measurement signal i interfered with by at least one secondary physical quantity different from the primary one, for example, by ambient temperature, or by ambient humidity or pressure, in the case of an ionization detector.

In order to correct for the influence of this second physical quantity, the detector (1) includes in addition a correction sensor (4) that measures the secondary physical quantity, and which is connected to the microprocessor's second analog input (2b) in order to send the microprocessor an analog electrical signal θ, referred to as the correction signal, having a value (for example, current or voltage) representing the secondary physical quantity.

The microprocessor (2) incorporates an internal memory, or it could be linked to an external memory, in which case the central unit will consist of the micro-processor and its external memory. In this memory is stored, in the form of a table of values, a curve c like the one shown in figure 2, giving a normal value i0 of the measurement signal as a function of the correction signal θ, in the absence of fire.

The microprocessor (2) is programmed to constantly determine the value of i0 corresponding to the correction signal θ, and to compare the measurement signal i with this value i0: if the measurement signal is not between i0 – Δ1 and i0 + Δ2, where Δ1 and Δ2 are pre-defined values (for example, Δ1 and Δ2 might have a value of 5 % of i0), the microprocessor (2) deduces the existence of a fire in the vicinity of the detector (1), and transmits an alarm signal to a central unit (5) by any known means, such as a current loop link, a bus link, etc.

It is possible, where the measurement signal i is interfered with by several physical quantities other than the primary physical quantity, that the detector (1) may incorporate several correction sensors (4, 6), each linked to an

analog input (2b, 2c) of the microprocessor (2), without its falling outside the context of this invention.

In this case, the microprocessor (2) has stored in memory a correspondence table giving the normal values i0 of the measurement signal as a function of the correction signals transmitted by the various correction sensors, in the absence of fire. Just as previously, the microprocessor (2) constantly calculates the normal value i0 of the measurement signal and then compares the measurement signal i received at its analog input (2a) to the normal value i0, as explained above, in order to determine if there is a fire.

CLAIMS

1. Fire detection device (1), incorporating a fire sensor (3) to measure a primary physical quantity, a variation in which is indicative of the existence of a fire in the vicinity of the detection device, this fire sensor generating an analog electrical signal (i), referred to as the measurement signal, having a value representing the primary physical quantity, this measurement signal being influenced by at last one secondary physical quantity different from the primary physical quantity, the device incorporating in addition at least one correction sensor (4, 6) to measure said secondary physical quantity, with a view to correcting for the influence of this secondary physical quantity on the measurement signal, characterized by the fact that the fire (3) and correction (4)sensors are linked to a programmable central unit (2) in order to transmit to it the measurement and correction signals respectively, the central unit having stored in memory a value i0 of the measurement signal (i) referred to as normal, as a function of the value of the correction signal (θ) in the absence of fire, and the central unit being programmed:

- to determine the normal value i0 of the measurement signal as a function of the value of the correction signal, based on a correspondence table,
- and to determine the existence of a fire when the measurement signal lies outside the range i0 – $\Delta 1$ and i0 + $\Delta 2$, where $\Delta 1$ and $\Delta 2$ are pre-defined values.

2. Device as per claim 1, in which the secondary physical quantity is the ambient temperature.

3. Device as per claim 1, in which the fire sensor is an ionization detector, and the secondary

physical quantity is the ambient humidity

4. Device as per claim 1, in which the fire sensor is an ionization detector, and the secondary physical quantity is the ambient pressure.

5. Device as per any one of the preceding claims, in which the measurement signal (i) is influenced by several secondary physical quantities, the device incorporating several correction sensors (4, 6) each linked to the central unit (2) in order to each transmit to it a correction signal (θ) having a value representing one of these secondary physical quantities, the correspondence table stored in memory in the central unit (2) giving the normal value i0 of the measurement signal (i) as a function of the values of the correction signals, and the central unit (5) [*translator's note: apparent error here, I believe this should in fact be* (2)] being programmed to determine the normal value of the measurement signal as a function of the correction signal values based on said correspondence table.

[FIGURES 1 & 2]

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PRELIMINARY SEARCH REPORT
based on the latest claims submitted before commencement of the search

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DOCUMENTS REGARDED AS BEING RELEVANT		Relevant claims in application examined
Category	Mention of document, indicating if necessary the relevant parts	
A	EP-A-0 418 409 (SIEMENS AKTIENGESELLSCHAFT) * the whole document *	1–5
A	EP-A-0 140 502 (COLE) * the whole document *	1

TECHNICAL DOMAINS SEARCHED (Int. Cl. 6)
G08B

Search completion date	Examiner
19 April 1995	Wanzeele, R

CATEGORIES OF DOCUMENTS QUOTED

X: especially relevant alone
Y: especially relevant in combination with another document of the same category
A: relevant in connection with at least one claim or general technological background
O: non-written disclosure
P: inserted document

T: theory or principle behind the invention
E: patent document with an earlier submission date, only published at this submission date or at a later date
D: quoted in the application
L: quoted for other reasons
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